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SLIT-LAMP EXAMINATION OF THE VITREOUS AND THE FUNDUS*

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EXAMINATION of the vitreous body and of the fundus with the help of the slit-lamp enables us to understand better some pathological pictures, and often facilitates a differential diagnosis. Since more details are being revealed by this method, pathological changes can be detected early. Moreover, stereoscopic examination of the fundus is made possible by a cheap additional device to the slit-lamp which not only does the work of a binocular ophthalmoscope of Gullstrand, but gives better results.

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The method consists in reducing as much as possible the angle between the illuminating arm and the microscope of the slit-lamp by means of a special prism (Fig. 1), and in eliminating the refraction of the cornea. We obtain this result with the help of a contact glass made of plastic. Instead of a contact glass, Lemoine and Valois, and later Hruby, used a concave lens of 55 dioptries in front of the eye. The contact glass affords a great field of vision, and in general cleaner pictures of the fundus when observed with a 20x magnification; it can be centred on the eyeball very easily. The astigmatic distortion in 20x magnification can be made very

FIG. 1.

small, and even reduced to zero—especially if one examines with a short slit—when the point examined lies in a region about 25° round the posterior pole. By 10x magnification, this region is still greater. In certain cases—for instance shortly after intra-ocular operations—the concave lens is preferable.

In such an examination, the most important point is to see the vitreous and the fundus *stereoscopically*. This is the chief condition for seeing fine details and avoiding deceptive pictures. After having dilated the pupil to a maximum, one always succeeds in seeing a great part of the fundus stereoscopically. The apparent place of the object observed with our model of the slit-lamp (Haag-Streit) being in the axis of revolution of the whole instrument, the picture does not move if the microscope and illuminating arm are turned about this axis. Thus one always finds a position where the observed point of the fundus is seen stereoscopically. Lateral movements of the instrument make other points of the fundus appear in the field of the microscope.

For examination of the vitreous the angle between the illuminating arm and the microscope is made as wide as possible if one

wishes to eliminate the reflected light from the fundus during the examination in focal light.

On the contrary, if one intends to examine fine changes of the vitreous in reflected light by the slit-lamp, the red reflex of the fundus affords the luminous background. For this purpose and for the examination of the deeper parts of the vitreous, the angle of the slit-lamp must be reduced. The most important change in the vitreous, besides inflammatory disorders and bleeding, is its detachment: one sees the vitreous framework condensed in the inferior part of the vitreous space and limited upwards by a border against an optically empty space (Fig. 2). The framework of the vitreous extends upwards only behind the lens. In front of the papilla, there is a more refractive glassy ring or thread upon the posterior border of the vitreous. In some cases, the point where the vitreous still adheres to the retina is easily visible.

In many cases of detachment of the retina one can see exactly where the *corpus vitreum* pulls on the borders of the hole. On the whole, biomicroscopy often shows clearly the mechanism of the origin of a detachment of the retina. This can be illustrated by a case.

We first saw the patient in February, 1945, in our clinic. He had had repeated haemorrhages into the vitreous. He had now a detachment of the vitreous in the upper part, but downwards an early flat detachment of the retina. In the upper part one saw here and there blood elements in front of the retina, and in the lower part, in the region of the detached retina, an extended horizontal blood-line; just above this blood-line (Fig. 3) was a triangular hole in the retina. With the slit-lamp, one saw that this curious blood-line showed how far the vitreous was detached from the retina. Underneath this line, retina and vitreous were connected together, and above this line they were separated. Blood had collected in the pocket between vitreous and retina, forming a transverse streak. The detachment of the vitreous extended only as far as the lower border of the hole in the retina. From there began a combined detachment of retina and vitreous. The mechanism of the repeated haemorrhages and of the hole in the retina was the following: As usual, the detachment of the vitreous had begun in the upper part. Owing to vascular lesions of the retina, there occurred haemorrhages as seen sometimes in elderly people. We know that a detachment of the retina often begins with haemorrhages into the vitreous. Now the detachment of the vitreous progressed, causing from time to time small haemorrhages, and finally a tear in the lower part of the retina where the detachment of the vitreous body had largely progressed. From that time, no further detachment of the vitreous followed, but vitreous and retina together detached themselves from the choroid and remained connected with each other. The genesis of this process was proved by the further history of the case. The hole was coagulated by diathermy and the patient was kept in bed in a half-sitting position, as Gonin recommended for holes in the lower region of the eye. The retina did not attach itself. We supposed that the cause of the failure was that in a sitting position the vitreous pulled down the retina from the choroid. Therefore, after a second intervention, the patient was kept flat on his back so that the vitreous pressed the retina towards the posterior wall of the eyeball, and the detachment was cured.

In eyes with inflammatory changes in their posterior part, either uveitis or neuritis, one often notices a Tyndall phenomenon* in

* Aqueous and other forms of flare are known in Switzerland as the Tyndall phenomenon.

FIG. 2

Hans R. aged 28 years. R. eye. State after juvenile haemorrhage into the vitreous detachment of the vitreous. Illumination from the left side. 10 $\times$.

FIG. 3

Fritz S. aged 55 years. R. eye. M: site of the macula. P: site of the papilla. V: back border of the detached vitreous. R: detached retina. Ch: Choroid. H: triangular hole in the retina. B: pre-retinal haemorrhage in the pocket between detached vitreous and retina. Illumination from left. 20 $\times$.

FIG. 4

Fritz A. aged 55 years. R. eye. Retinitis proliferans diabetica. Vascularisation of the back vitreous membrane. V: Section of the back membrane of the vitreous. R: Section of the retina. The vessels of the membrane are visible directly on its section and in the light reflected by the fundus. 20 $\times$.

FIG. 5

Jakob B. aged 35 years. R. eye. Chorio-retinitis centralis serosa. Illumination from the left side. 20 $\times$.

FIG. 6

Werner R. aged 40 years. L. eye. Retinitis centralis serosa para fovealis with detachment of the vitreous.

FIG. 7

FIG. 7 (a)

Louis L. aged 60 years. L. eye. Retinitis diabetica. Capillarosis spots. Situation *vide* sketch. (A) narrow slit 20 $\times$. (B) wider slit 20 $\times$. One sees the shadow of the one spot on the choroid. (C) and (D) the same as (A) and (B) schematized at 40 $\times$ magnification to show more clearly the site of the capillarosis spots in the thickness of the retina (C) and the shadow on the choroid.

FIG. 8

Ida G. aged 58 years. R. eye. Drusen of the choroid. 20x.

FIG. 9

Alfred G. aged 29 years. L. eye. Ablatio retinae post-traumatica peripherica. Cysticoedema of the macula. Illumination from the right side. 20x.

FIG. 10

Anna St. aged 76 years. L. eye. Hole in the macula. Typical thickened and opaque borders.

FIG. 11

Rosa I. aged 35 years. L. eye. Choroiditis disseminata. In the upper part fresh inflammation; beside the papilla, old foci.

FIG. 12

Erika M. aged 68 years. L. eye. Old focus of choroiditis centralis with depressed choroid and thinned retina.

the posterior vitreous space. In cases of periphlebitis retinae, the posterior limiting membrane of the vitreous is detached from the retina and the vessels of the proliferating scars are situated in this membrane (Bangerter-Blaser, Hruby) (Fig. 4). At the onset of many retinal diseases (for instance chorioretinitis), the posterior limiting membrane of the vitreous is detached from the retina and visible in the optical section as a very fine greyish line. In the reflected light of the fundus, in such cases, one often sees in it fine precipitates.

Slit-lamp examination of the fundus is the best method for examining the posterior part of the retina, especially the macula. If one examines the retina in the large pencil of the slit-lamp the slightest traces of irregularities in thickness appear as irregularities of the surface reflexes.

By observing a normal retina with the slit-lamp, one sees very clearly the configuration of the papilla, the nerve fibres of the retina, the depression of the fovea, and the thickness of the retina in the cross-section. The thickest part of the normal retina is situated on the temporal side of the papilla and around the macula, where one sees, by ophthalmoscopic examination, the wall-reflex of the macula. The normal retina is thinnest at the fovea.

Slit-lamp examination has its greatest value in the following changes:

1. Papilloedema, which can be seen as well by this method as with the binocular ophthalmoscope of Gullstrand. We cannot agree that slit-lamp examination shows definite differences between early papilloedema and papillitis. We have seen detachment of the limiting membrane in both. Certainly the flattening of the central depression of the papilla does not constitute a differential sign between neuritis optica and papilloedema, nor could we see with a 20x magnification perivascular lymph spaces. However, in cases of true papillitis we often see a distinct Tyndall phenomenon in front of the papilla, or fine precipitates on the detached vitreous membrane.

2. Retinitis centralis serosa gives a very characteristic picture. If this disease is situated just in the macula including the fovea, the perifoveal part is prominent, with an umbilical depression in the fovea, so that the optical section of the retinal surface resembles a Cupid's bow (Fig. 5). The retina is not disturbed. Its posterior limit is not distinct. In front of the choroid there seems to be an empty interval. White spots are visible in front of the choroid, apparently situated on the invisible posterior border of the retina. In front of the oedematous retina, we saw, in our latest cases, a very fine vitreous membrane, a sign of a slight detachment of the vitreous. At first the aspect of the choroid is almost unchanged.

Later on, it becomes slightly marbled. This disease is often mistaken for retrobulbar neuritis, for it is accompanied by a relative central scotoma, generally with only little decrease of visual acuity. Subjectively, there is a yellowish positive scotoma, best visible just after awaking; metamorphopsia exists, easily demonstrable by means of the Amsler lattice. During the disease, the refraction is more hypermetropic than before or after. All these characteristic signs are less pronounced if the changes are situated away from the fovea (Fig. 6). Then the complaints of the patient are indistinct: slightly blurred vision, and a certain distortion of lines. In such cases, the correct diagnosis is seldom made without an examination with the slit-lamp. One mostly assumes nervous disorder, especially because chorioretinitis centralis serosa is often found in vasolabile individuals. The aetiology of this affection is not known, but vasolability seems to favour it. As therapy, we use with success a series of intravenous injections of mercury cyanide (daily 1 c.cm. 1 per cent. solution, 20x) with the usual control of urine and mouth. This disease is not rare, but often overlooked.

3. With the help of biomicroscopy of the fundus, it is very easy to discern little spots of capillarosis from Drusen of the choroid. Capillarosis spots (as signs of a vascular disturbance of the retina) are situated within the thickness of the retina and are always opaque and white; with the slit-lamp often one sees their shadows on the screen of the choroid (Fig. 7). Drusen are situated on the surface of the choroid; their colour is generally yellowish (Fig. 8). When illuminating their neighbourhood, one often sees a golden reflex on their borders. But there exist also little white inclusions on the surface of the choroid not protruding from it. The ophthalmoscopic picture they present is like that of capillarosis spots. Only by the slit-lamp is differentiation possible.

4. Oedema of the retina can be seen very easily. Cystic oedema of the macular region has an extremely beautiful aspect (Fig. 9). The differential diagnosis between cysts of the macula and holes in the macula—which is very difficult with other methods—is very simple by means of biomicroscopy.

A cyst of the macula has an anterior wall which does not appear in the case of a hole (Fig. 10). Little cysts are often more easily visible by indirect illumination than in the focal light of the slit-pencil. Cystoid oedema of the macula is frequent in cases of uveitis, vascular disturbances of the posterior pole of the retina and the choroid (for instance thrombosis of the central vein, arteriosclerotic changes of the choroidal vessels at the macula); in degenerative disciformis maculae (Junius-Kuhnt); in older detachments of the retina, also sometimes in re-attached cases. However, there are rare cases of cystoid oedema without an assignable cause.

In cases of malignant hypertension, one frequently finds considerable oedema of the retina (without cysts), together with capillarosis spots, haemorrhages and "cotton-wool" degenerations of the nerve fibres. This oedema is very turbid, so that the choroid is seen only indistinctly. On the other hand, in many cases of pure diabetic retinopathy and in Junius-Kuhnt disciform degeneration, a glass-like thickening of the retina appears, so transparent that the shadows of the retinal vessels are seen clearly on the surface of the choroid. The layer where a haemorrhage is situated can be determined exactly.

5. The normal surface of the choroid is smooth. With some aged people it looks rough, as if treated with emery paper. In certain cases it gives the impression that this picture preceded a Junius-Kuhnt disciform degeneration.

6. The differential diagnosis between a detachment of the retina and a tumour of the choroid may be difficult. But if one sees, with the slit-lamp, the bulging tumour behind the detached retina, the diagnosis is much easier.

In a case of angioma of the choroid beside the papilla—the diagnosis was made *after* enucleation—the retina in front of the tumour was very thickened and there was an extensive cystic degeneration. In view of the fact that in histological preparations of this disease an extensive cystic degeneration of the retina is almost always found in front of the tumour, the presence of an extensive cystoid degeneration in front of a tumour not at the macula may be of diagnostic value.

7. It seems to be of practical importance that in cases of choroiditis the retina is blurred and often slightly thickened in front of a focus of fresh inflammation (Fig. 11). Healed choroiditic scars are usually a little depressed, and the retina in front of them is of glass-like transparency. In old disseminated choroiditis (Fig. 12) it is sometimes very difficult to determine by means of the ophthalmoscope if there is fresh inflammation on the border of an old focus; slit-lamp examination enabled us to do so.

This short survey may show the diagnostic importance of slit-lamp microscopy of the fundus.

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